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FLOOD INSURANCE STUDY
TOWN OF ATTICA, NEW YORK

## 1.0 INTRODUCTION

### 1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Attica, Wyoming County, New York, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to allow Attica to continue participation in the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

This Flood Insurance Study was prepared by compiling pertinent information for the flood hazard areas in the Town of Attica from existing technical and/or scientific data originally prepared by others for uses other than the preparation of this Flood Insurance Study. This existing data was reviewed by FEMA prior to its use in the development of this Flood Insurance Study to ensure compliance with the National Flood Insurance Program (NFIP) accuracy requirements.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3. In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

### 1.2 Authority and Acknowledgements

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the original study were performed for the Federal Emergency Management Agency (FEMA). In this updated study, the hydrologic and hydraulic analyses were performed by the Buffalo District of the U. S. Army Corps of Engineers (COE) during preparation of a Special Flood Hazard Evaluation. This work was completed in October 1984.

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### 1.3 Coordination

On August 26, 1985, the results of this study were reviewed at a final CCO meeting attended by representatives of FEMA and the Town of Attica.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Attica, Wyoming County, New York. The area of study is shown on the Vicinity Map (Figure 1).

Tonawanda Creek was studied by detailed methods from the downstream corporate limits to the upstream side of State Route 98. The areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data.

The following flooding sources were studied by approximate methods: both Attica Reservoirs, Crow Creek, Baker Creek, and several unnamed tributaries. Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have available detail scientific or technical data.

### 2.2 Community Description

The Town of Attica is located in the western portion of the State of New York. It is bordered by the Town of Alexander and the Village of Attica to the north, the Town of Bennington to the west, the Town of Orangeville to the south, and the Town of Middlebury to the east.

### 2.3 Principal Flood Problems

Most of the area along Tonawanda Creek is agricultural or residential. Although large floods have occurred, studies indicate that even larger floods are possible.

Historical records have documented flooding along Tonawanda Creek for more than 100 years. According to these records, most of the floods in the Tonawanda Creek Watershed have been caused by snowmelt augmented by rainfall. The magnitude of a snowmelt flood is highly dependent upon the amount of snowpack, and the magnitude and temporal variation of temperature.

Major floods on Tonawanda Creek occurred in March 1865, July 1902, March 1904, March 1916, June 1928, April 1940, March 1942, March 1956, January 1957, January 1959, March 1960, June 1972, September 1977, and March

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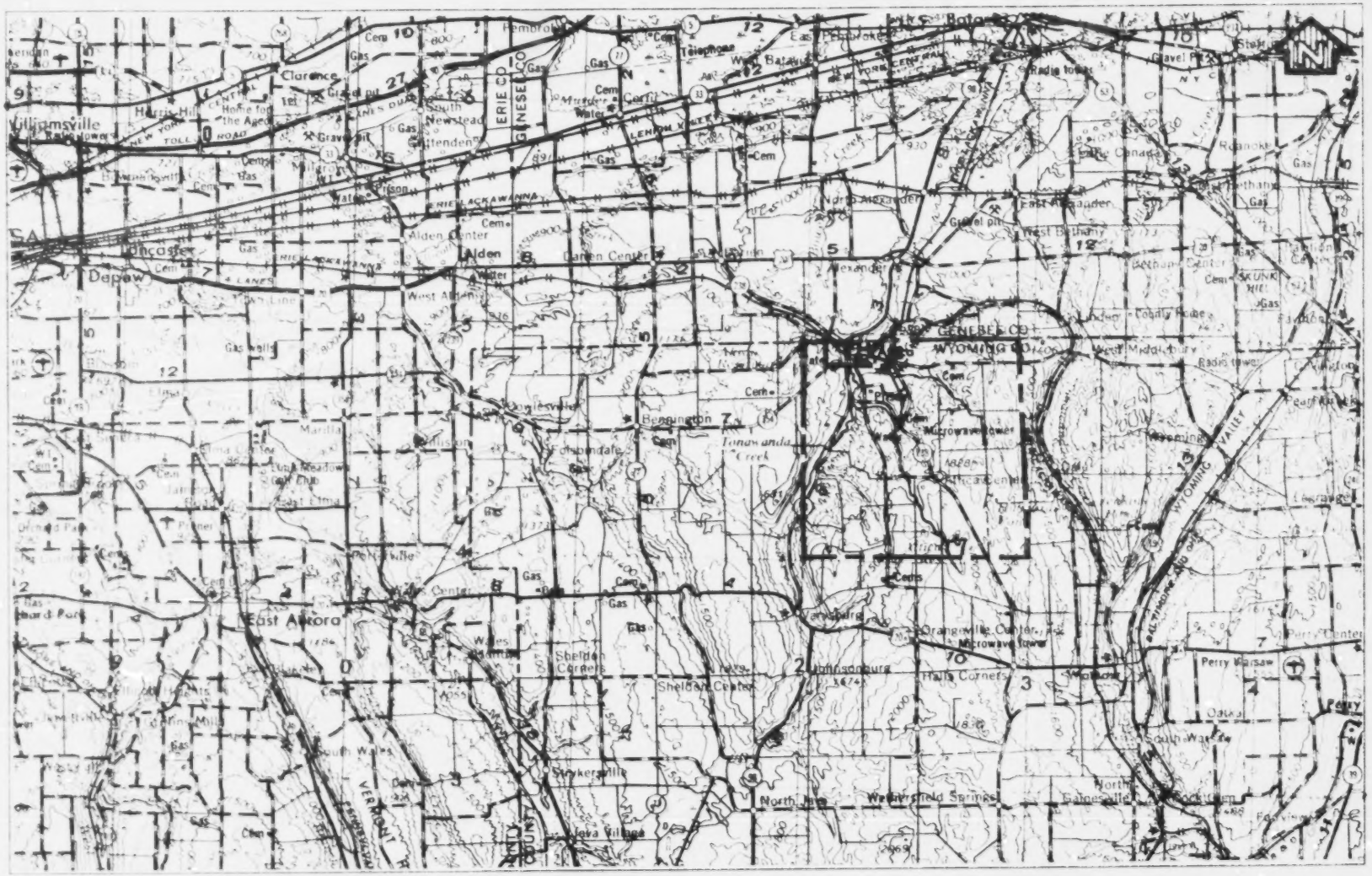


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF ATTICA, NY**

**(WYOMING CO.)**

APPROXIMATE SCALE

4 0 4 8 12 MILES

**VICINITY MAP**

1979. During the flood of July 1902, severe flooding was created in the nearby Town of Attica. A tremendous rain caused Tonawanda Creek to turn into a river; moreover, a dam along Crow Creek failed and added its water to the flood. The blacksmith shop was demolished, and sheds were moved. Several feet of water entered the homes along Water and Exchange Streets. Railroad beds were damaged and traffic was suspended for several days. Along the creek, farms were underwater, crops were lost, bridges were destroyed, and stores were flooded with goods being watersoaked or washed away.

In 1949, the stream channel was straightened and widened, as well as a larger bridge opening added along Prospect Street at the north end of the village. This has helped to alleviate spring floods; however, some flooding problems occurred in June of 1972 and 1974.

Floods of the same or larger magnitude as those that have occurred in the past are likely to occur in the future. Floods larger than those on Tonawanda Creek have been experienced in the past on streams with similar geographical and physiographical characteristics as those found in the study area. Similar combinations of rainfall, snowmelt, and runoff that caused these floods could occur within the study area in the future. To assess the flooding potential of the study area, it is necessary to consider storms and floods that have occurred in regions with the same topography, watershed cover, and physical characteristics.

## 3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

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## 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the community.

The hydrologic information for Tonawanda Creek was obtained from the COE report: Interim Report on Feasibility of Flood Management, Tonawanda Creek Watershed (Reference 1).

Peak discharges for the 10-, 100-, and 500-year floods of Tonawanda Creek are shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

| FLOODING SOURCE AND LOCATION | DRAINAGE AREA (sq. miles) | PEAK DISCHARGES (cfs) 10-YEAR | 100-YEAR | 500-YEAR |
|---|---|---|---|---|
| TONAWANDA CREEK | | | | |
| At U. S. Geological Survey (USGS) Gage No. 04216418 in the Village of Attica | 77.1 | 6,900 | 10,100 | 12,500 |
| Upstream of confluence of Crow Creek | 64.7 | 5,600 | 8,500 | 10,200 |

## 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the hydraulic analysis for Tonawanda Creek were obtained by field survey. Bridges were surveyed to obtain elevation data and structural geometry in order to compute the significant backwater effects of these structures.

Roughness coefficients (Manning's "n") for the hydraulic computations were assigned on the basis of field inspection of the flood plain areas. Manning's "n" values are selected according to channel conditions, brush in overbank areas, presence of roads, parking lots and lawns, and other factors. For Tonawanda Creek, the channel "n" value was 0.040, and the overbank "n" values ranged from 0.040 to 0.060. Expansion and contraction coefficients of 0.100 to 0.300 and 0.300 to 0.600, respectively, were used in the hydraulic computations. The model was calibrated using the 1960 flood; water-surface profiles were then computed for several frequency flows listed in Table 1.



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Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 2). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for Tonawanda Creek were determined from critical depth.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

## 4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

### 4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps (Reference 3).

For the flooding sources studied by approximate methods, only the 100-year flood plain boundary has been shown. The approximate boundaries were delineated using the previously effective study for the Town of Attica (Reference 4).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.



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## 4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

A floodway has not been developed for Tonawanda Creek for several reasons. First, the stream has changed its course at many locations in the study area. Second, the velocities are prohibitive in many areas, with active erosion evident along the stream. Therefore, encroachment of the flood plain should not be encouraged. Third, a limited number of cross sections were taken along the stream, and a floodway determination could only be a rough estimate at best.

In the study area, Tonawanda Creek flows through narrow steep valley sections and wide flood plains. Also, its channel bed slope changes in several places from mild to steep and vice versa. The average distance between surveyed cross sections is approximately 2,000 feet. At several locations within the study area, flow passes through critical depth. Consequently, to define a satisfactory floodway for this area, additional field data would be required.

The New York State Department of Environmental Conservation (NYSDEC) had originally requested that a floodway be determined for this area; however, based on available time, funding, and limited field data, a floodway has not been defined at this time. In the steep areas along the stream where velocities are high and erosion is a problem, it is not



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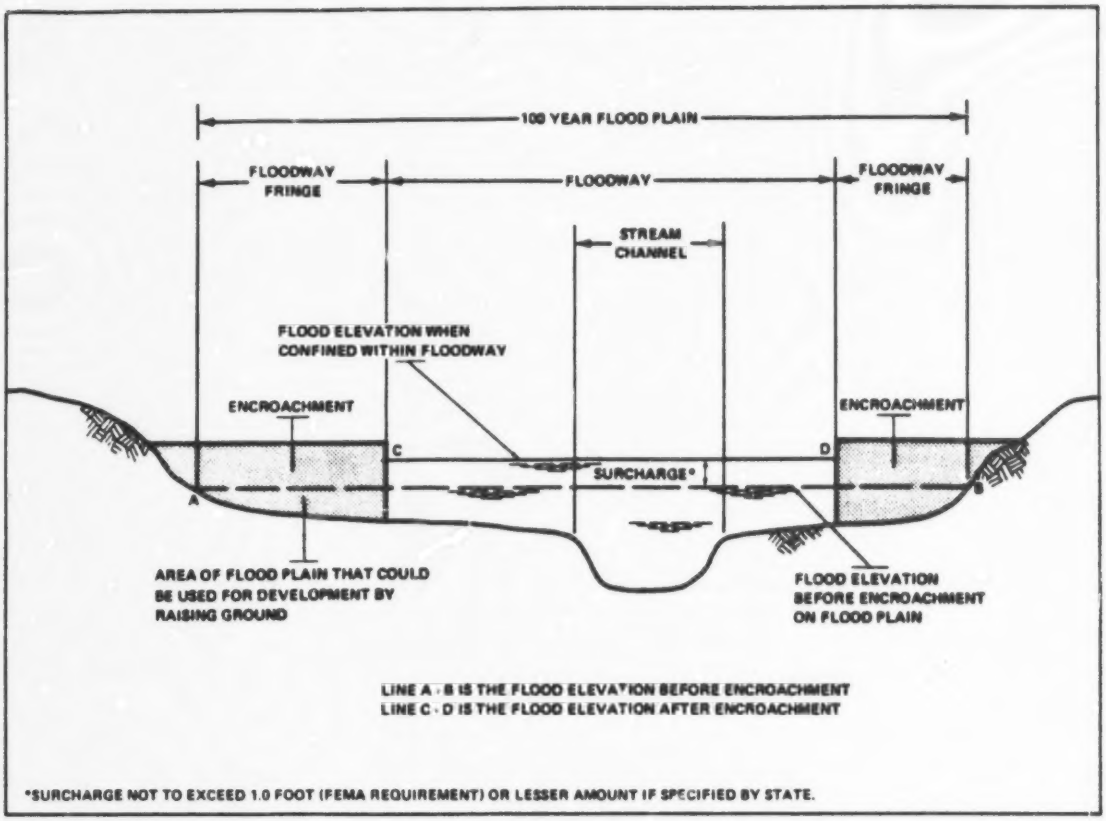
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

**FLOODWAY SCHEMATIC**

Figure 2

advisable to encroach on the existing flood plain. Encroachment would increase velocities and erosion problems, and a floodway should not be determined for these areas.

## 5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for the flooding source studied in detail in the Town of Attica.



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## 5.1 Reach Determinations

Reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following tabulation for more than 20 percent of the reach:

| Average Difference Between 10- and 100-Year Floods | Variation |
|---|---|
| Less than 2 feet | 0.5 foot |
| 2 to 7 feet | 1.0 foot |
| 7.1 to 12 feet | 2.0 feet |
| More than 12 feet | 3.0 feet |

The location of the reach determined for the flooding source of the Town of Attica is shown on the Flood Profiles (Exhibit 1) and summarized in Table 2.

## 5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

## 5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.



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| FLOODING SOURCE | PANEL[1] | ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND | | | FHF | ZONE | BASE FLOOD ELEVATION[3] (NGVD) |
|---|---|---|---|---|---|---|---|
| | | 10% (10 YR.) | 2% (50 YR.) | 0.2% (500 YR.) | | | |
| Tonawanda Creek Reach 1 | 04 | -1.2 | * | +0.7 | 010 | A2 | Varies |

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF ATTICA, NY**
(WYOMING CO.)

**FLOOD INSURANCE ZONE DATA**

**TONAWANDA CREEK**

Zone A2: Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHFs.

Zone B: Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding source studied in detail in the community are shown in Table 2.

### 5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Attica is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevation of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

## 6.0 OTHER STUDIES

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by other organizations originally for purposes other than the preparation of this Flood Insurance Study. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, Federal Emergency Management Agency, Regional Director, Region II Office, 26 Federal Plaza, Room 19-100, New York, New York 10278.



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Flood Insurance Studies are currently being prepared for the Town of Alexander and the Village of Attica (References 5 and 6). The results of those studies will be in complete agreement with the results of this study.

A Flood Insurance Study had been published previously for the Town of Attica (Reference 4). The differences between that study and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

## 7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Regional Director, Region II Office, 26 Federal Plaza, Room 19-100, New York, New York 10278.

## 8.0 BIBLIOGRAPHY AND REFERENCES


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5. Federal Emergency Management Agency, Flood Insurance Study, Town of Alexander, Genesee County, New York (Unpublished).

6. Federal Emergency Management Agency, Flood Insurance Study, Village of Attica, Wyoming and Genesee Counties, New York (Unpublished).


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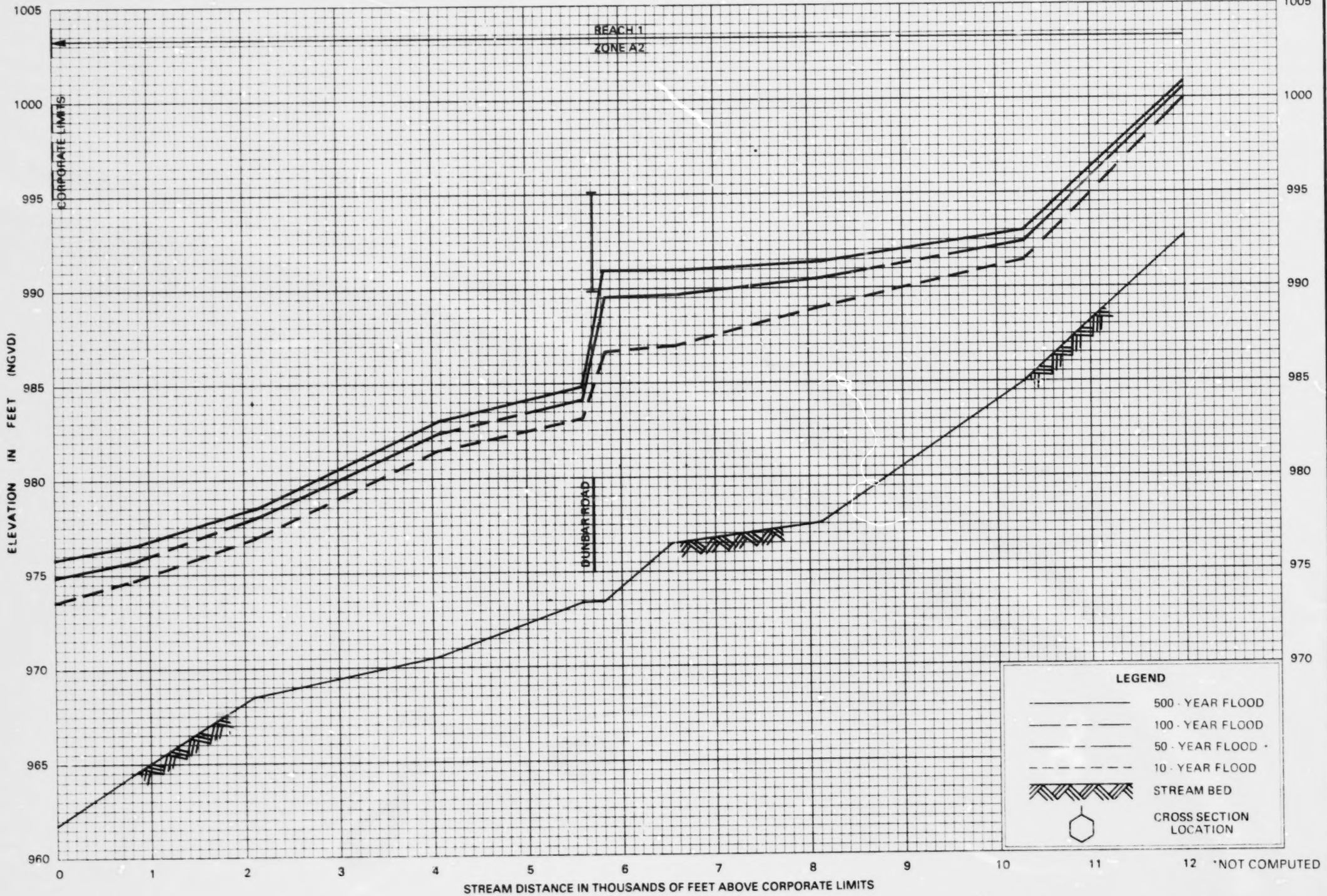


FLOOD PROFILES

TONAWANDA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF ATTICA, NY

(WYOMING CO.)

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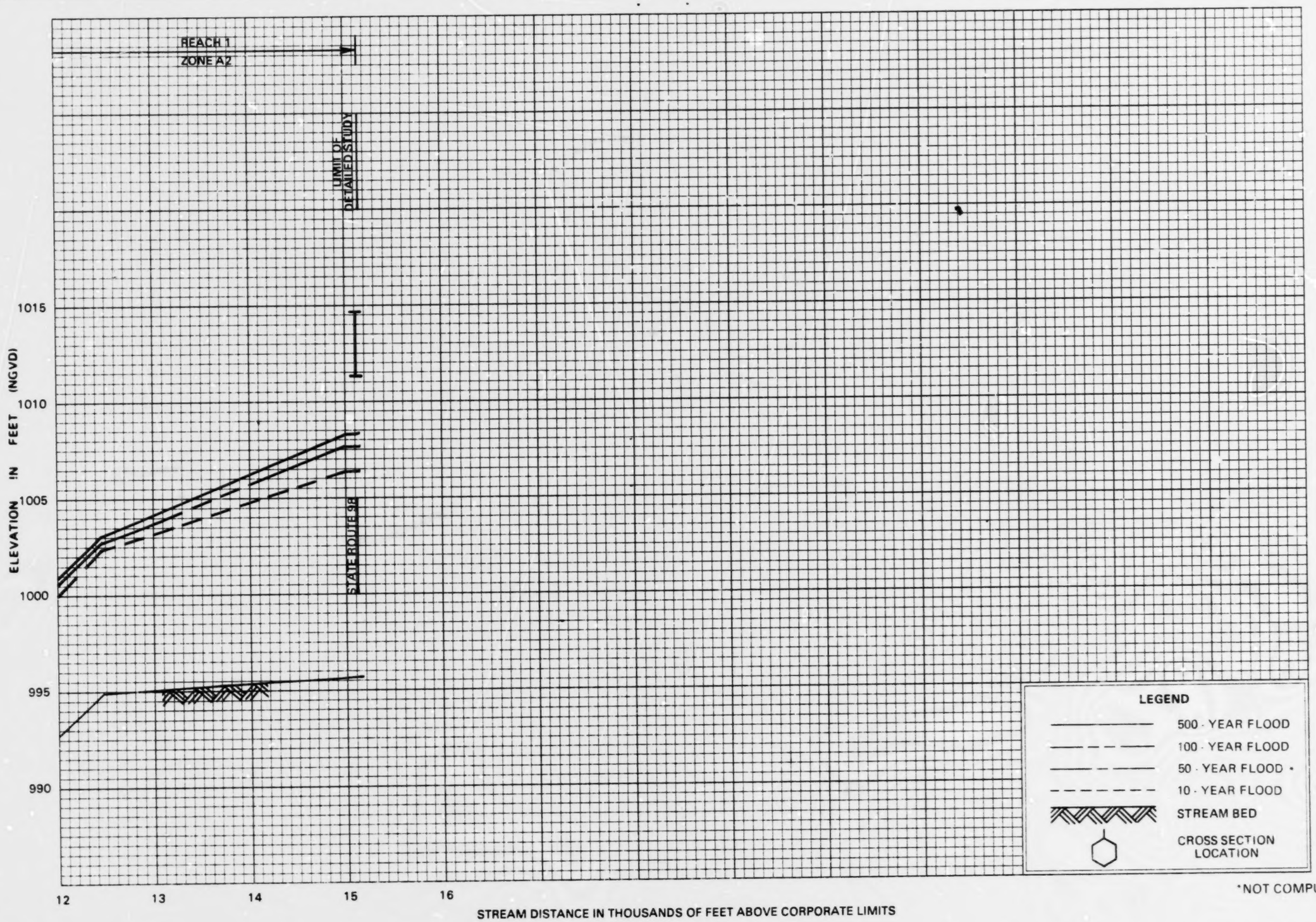


FLOOD PROFILES

TONAWANDA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF ATTICA, NY
(WYOMING CO.)

02P



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